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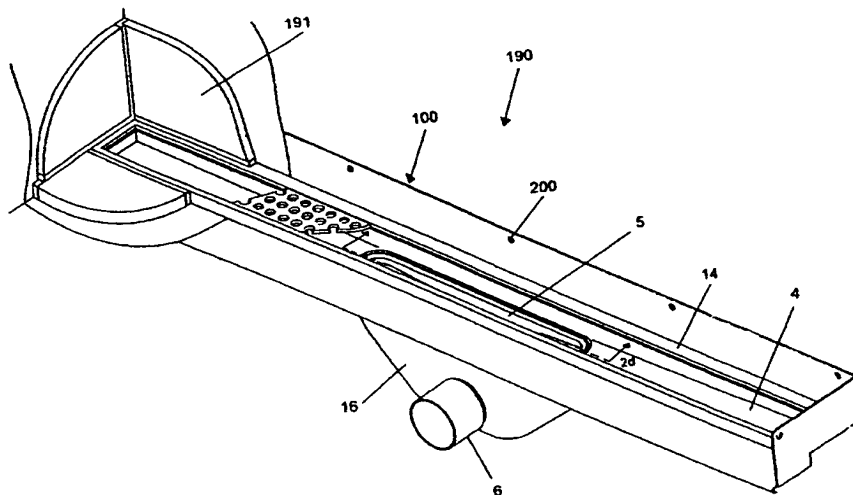
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**(54) Title:** A DRAIN AND A BUILDING STRUCTURE HAVING A DRAIN



(57) **Abstract:** A floor drain (100) comprising a bottom part (4) having at least one discharge opening (5), a front part being integral with the bottom part (4) and having a first part (3b) being inclined to said bottom part at an angle being at least 30°, such as at least 45°, preferably at least 60° more preferably at least 75° and even more preferably about 90° or at least 90° and having a flange part (3a) being horizontal or inclined to horizontal at an angle being less than 20° such as less than 17°, preferably less than 15°, such as less than 10°, more preferably less than 5°, tow side walls (2) integral with said bottom part and said first part, and a back part (1) being integral with said bottom part (4), said back part (1) extending vertically from the bottom part (4), through and above the plane defined by the flange part (3a).

## A DRAIN AND A BUILDING STRUCTURE HAVING A DRAIN

The present invention relates to a floor drain, a building structure having such a floor drain and a method for installing such a floor drain in a building structure. The building structure is in preferred embodiments of the invention a bathroom or the like in which water, being splashed to the walls and floor, is drained from the room by the drain situated in the floor and connected to the sewer.

## BACKGROUND FOR THE INVENTION AND INTRODUCTION TO THE INVENTION.

A technical problem in connection with such rooms is that the building structure defining the room must be sealed in a fluid tight manner in order to avoid water from penetrating into the wall and floor construction, which if occurring often results in rot in the structure which in turn requires a very expensive reconstruction of the structure.

While many - and excellent - solutions today exist for fluid tightening the walls and floor of such rooms no real solution to the problem regarding fluid tightening around the drain has been provided until now.

Fluid tightening around the drain is considered by experts to be a very delicate problem. Developments of today's drains has focused on adaptation of a sealing technique in which an initial liquid sealing compound (a membrane) is applied beneath the floor tiling, for tightening the floor at the intersection between the drain and the floor.

When using a conventional drain, i.e. a square shaped or circular drain, the drain must be placed at a distance from the walls of the structure to provide a sloping surface for leading water towards the discharge outlet. In this connection, the following problems/drawbacks are often experienced:

- the drain cannot properly be fixed,
- the grating of the drain is not level with the floor covering
- the drain is often misaligned during construction of the structure,

- the drain often tilts during construction of the structure,
- the drain cannot be placed very close to the structure's walls,
- the drain must be placed in the walking area of the structure,
- the construction's floor must be adapted to receive the drain,
- 5 - additional reinforcement must be included in the area around the drain,
- any reinforcement must be cut out around the drain,
- the floor is vulnerable in an area around the drain,
- the floor must be provided with a four-sided slope towards the drain; however, problems with water flowing in wrong directions with generation of pools of
- 10 water are often encountered in the final structure,
- the joint between wall and floor close to the drain is very vulnerable with respect to leaks, as the drain does not guarantee a seal between wall and floor,
- the joint between the floor and drain is vulnerable with respect to leaks,
- the drain does not guarantee a sealed joint between walls and floor,
- 15 - the floor tiles must be cut around the drain, i.e. no possibility to hole tiles around the drain is normally present,
- floor tiles cannot be laid down so as to produce the four sides inclination, which results in plain and non-functional floor tiling,
- cleaning of the drain is difficult,
- 20 - it is difficult to guide the water towards a small drain,
- the construction of the structure is difficult and results often in serious construction errors, which at the same time increased the construction time.

It is an aim of the present invention to provide a drain and a building structure  
25 eliminating some or all of these problems/drawbacks.

#### BRIEF DESCRIPTION OF THE INVENTION

The above problem is, in a first aspect of the invention, solved by providing a floor  
30 drain comprising

- a bottom part having at least one discharge,
- a front part being integral with the bottom part and having a first part being inclined to said bottom part at an angle being at least, 30°, such as at least 45°, preferably at least 60° more preferably at least 75° and even more preferably about 90° or at least

90° and having a flange part being horizontal or inclined to horizontal at an angle being less than 20° such as less than 17°, preferably less than 15°, such as less than 10°, more preferably less than 5°,

- two side walls (2) integral with said bottom part and said first part, and

- 5 - a back or rear part being integral with said bottom part, said back part extending vertically from the bottom part, through and above the plane defined by the flange part.

10 The drain according to the first aspect of the present invention thereby defines a trough-shaped fluid tight drain, the objective of the flange part and the parts extending above the flange part being to integrate the drain in a building structure in such a manner that an excellent water sealing may easily be obtained between the walls, floor and drain.

- 15 The back part may also include mounting means allowing the drain to be fixed to the wall or floor of a building structure in a well-defined position when installing the drain.

20 By forming the drain as defined in claim 2, the drain may accommodate for the thickness of the wall covering.

25 In an embodiment of the invention, the drain may further be provided with one side part or two opposed side parts each of which being integral with said bottom part and said first part. The at least one side wall extends in vertical direction from the bottom part, through and above a plane defined by the flange part. This drain is particularly suitable for use in narrowly confined spaces, such as in a shower bath.

30 It may be desirable to provide the drain with a trap to avoid smell from the sewer spreading into the structure in which the drain is integrated. Thus, according to a preferred embodiment of the invention, the drain is provided with a trap which comprises a funnel shaped part having a straight part and comprising a bowl shaped part having a straight part being water penetrable distant from its bottom, said straight parts are arranged concentric to each other in such a manner that at least a

part of the straight part of the funnel shaped part extends inside at least a part of the straight part of the bowl shaped part.

5 Preferably, when the floor drain is to extend along a wall, the trap may comprise a first elongated element including a funnel shaped part and a second elongated element including a bowl shaped part, said first element extending at least partially inside said second element, said first and second element being adapted to provide a flow of water essentially in two opposed directions parallel with the extension of said elongated bottom part. In this manner, a floor drain having a very small dimension  
10 perpendicularly to said wall may be provided.

In yet another aspect of the present invention a building structure is provided, which building structure defines a room, which structure comprising at least one wall and a floor having a watertight covering surface of tiling, a vinyl sheet or the like, said  
15 structure comprising a floor drain according to the first aspect of the present invention, optionally having a trap.

In this aspect, the floor drain is arranged in the structure so that:  
- the flange part of the drain is situated below the watertight covering surface of the floor, and so that  
20 - at least a part of the drain's back part which extends above the plane defined by the flange part is covered by the watertight covering surface of the structure's back wall, whereby the drain assembles the floor and the at least one wall in an integral manner in the drain area, that is, the area in the vicinity of the location of the drain.

25

#### BRIEF DESCRIPTION OF THE DRAWINGS

In the following, the invention and preferred embodiments thereof will be described in connection with the accompanying drawings in which

30

Fig. 1 shows a building structure, according to the present invention and more specifically a section of a floor and the walls of a bathroom with the drain integrated in the room in a first embodiment of the invention,

Fig. 1a shows a cross sectional view of the building structure shown in fig. 1,

Fig. 1b shows a cross sectional view of a building structure similar to the one shown in fig. 1,

5

Fig. 2 shows a section of a floor and the walls of a bathroom with the drain integrated in the room in a second preferred embodiment of the present invention,

Fig. 2a shows a cross sectional view of the building structure of fig. 2,

10

Fig. 2b shows a perspective view of a floor drain similar to the one shown in fig. 2a,

Fig. 2c shows an enlarged view of the water discharge and trap depicted in fig. 2b,

15

Fig. 2d shows cross-sectional views of the trap in fig. 2b, seen in direction 2d marked in fig. 2b and perpendicularly thereto,

Fig. 3 shows a longitudinal cross section of an embodiment of a drain according to the present invention,

20

Fig. 3a shows in detail an exploded view of the trap shown in fig. 3,

Figs. 4a and 4b illustrates further variations of the floor drain,

25 Fig. 5 shows a transverse cross section of a detail of an alternative embodiment of the building structure according to the present invention,

Fig. 6 shows a transverse cross section of a detail of a further, alternative embodiment of the building structure according to the present invention, and

30

Fig. 7a-7f illustrates a method of constructing a building structure incorporating a floor drain according to the invention.

## DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

5 In the following the invention will be described in greater details and in particular different embodiments thereof will be addressed. The preferred embodiments will be addressed in connection with a bathroom. It should, however, be obvious for those skilled in the art, that the invention also is applicable to other kinds of rooms designed in such a manner that the walls and floor of the rooms are exposed to running water and wherein the water is to be drained.

10

In the following description, numerals used for identification of similar parts in different embodiments of the invention are the same in order to ease the understanding of the invention only.

15 In fig. 1 a section of the brick, concrete or plaster board wall and floor of a bathroom in which the drain is integrated is shown. The bathroom comprises the drain 100. The drain 100 is an elongated device and has a vertical back wall 1 integral with two vertical side walls 2, a front wall 3 comprising a horizontal part 3a and a vertical part 3b, and a bottom part 4. The drain 100 further comprises an outlet 5, which is connected  
20 to the sewer by pipe 6, and the surface of bottom part 4 slopes towards the outlet 5. The drain 100 is constructed/designed in such a manner that these parts define a fluid tight drain - if, of course, the leak provided by the outlet 6 is not regarded.

The walls of the room further comprise watertight membranes 7, covered by  
25 respectively a tiling 8 and a floor tiling 9. At the intersection between the tiled lining of the floor 9 and the walls and at the intersection between the two walls the joints 10 are sealed by use of silicon or the like in order to take up small geometrical changes without damaging the sealing of the walls and floor.

30 As stated earlier, one aim of the present invention is to provide a building structure which is water tight close to or at the joint between the drain and the walls/floor. This is provided, as indicated on fig. 1, in the first preferred embodiment by designing the drain 100 so that the back wall 1 and side walls 2 extend above the level of the floor (the level of the floor being defined by the upper surface of the floor tiling).



The back wall 1 and side walls 2 of the drain 100 are placed into contact with the wall construction of the bath room and the water tight membrane 7 is applied to the front surface of the back wall 1 and the side walls 2 of the drain 100 as well as to the wall construction. Finally, the tiling is attached to the membrane 7. The horizontal part 3a of the front wall 3 is placed below the watertight membrane 7 upon which the floor tiling is placed. As may be seen, no floor covering behind and beside the drain is required and the slope of the floor needs only be unidirectional (towards the drain) and not as usual four sided.

Sealing of the room at the vicinity of - or at the - drain 100 is thus provided by the water sealing at the back and side walls of the drain and by the water sealing provided in the floor by the horizontal part 3a of the front wall 3.

The floor of the bathroom is typically inclined with respect to horizontal towards the drain. This inclination is normally provided by leveling layer situated beneath the floor tiling 9 and the watertight membrane 7. The horizontal part 3a is inclined in the same manner so as to reflect the inclination of the floor in order to provide a receiving surface for the floor tiling being smooth.

In case a grating is to be used in connection with the embodiment of fig. 1 this grating may be resting on supports abutting the bottom part.

Fig. 1b shows a slightly modified drain provided with mounting means for securing the drain to the wall. The mounting means may include perforations or holes 200 arranged in the back wall 1 and the side walls 2 and by means of which the drain may be secured to the wall 190, either directly or via a mounting bracket 250 onto which the drain may be secured by means of a screw or other attachment means.

In use the drain 100 is preferably designed to extend across the width (length) of the bathroom.

The drain 100 may further comprise a grating 12 as shown in fig. 2. The grating comprises inclined abutment surfaces 12a and the drain 100 comprises corresponding

bearing surfaces 15. In this embodiment the vertical part 3b extends above a plane defined by the horizontal part 3a and the bearing surface 15 extends from the termination of the vertical part 3b in a direction being inclined relative to the vertical part 3b. The reason for extending these parts above said plane is to elevate the grating to the level of the surface of the floor tiling and to embed/protect the edge of the floor tiling.

The embodiment of the elongated floor drain shown in fig. 2b comprises a trap 16 that allows for a significant reduction in the width of the drain perpendicular to the main extension thereof, i.e. perpendicular to the wall surface carrying tiling 191. The bottom part 4 of drain 100 is provided with an elongated outlet 5 for discharging water and in which the trap to be discussed below is mounted. The outlet pipe 6 connected to the outlet 5 extends generally horizontally perpendicularly to the main extension of the floor drain to connect with discharge tubes that extend generally horizontally with a small inclination beneath the floor tiling. The outlet pipe 6 may alternatively be connected to the trap so as to extend vertically there from.

This trap 16 is shown in greater details in fig. 2c. As seen, the trap 16 is assembled from three pieces, an elongated upper piece 50, an elongated lower piece 51, and a receiving bowl 6' connected to the outlet pipe 6 and to the floor drain 100. The upper piece 50 is mainly funnel shaped having a straight part 31 with opposed parallel generally planar walls 31' and the lower piece 51 is mainly bowl shaped with two opposed parallel generally planar walls 36'.

Through the design of the trap 16, the flow of water is split up such that water essentially flows in two opposed directions, shown more clearly in fig. 2d, into the receiving bowl 6'. Preferably between 90% and 100%, more preferably essentially all, of the total flow of water flows in said two opposed directions.

For the purpose of assembling the trap 16, opposed walls 31' and opposed walls 36' are mutually spaced such that the upper piece 50 may fit snugly into or outside the lower piece 51, as shown in fig. 2d. Walls 31' and 36' may then be connected, e.g. by welding, to provide an integral unit which is then inserted into the receiving bowl 6' and nested on a sealing ring 33, through the elongated outlet 5.

In another embodiment of the floor drain (not shown), the bearing surface 15 is constituted by a ledge provided in the horizontal part 3a and the abutment surface of the grating 12 has abutment surfaces corresponding to said surfaces of the horizontal part 3a.

In yet another alternative of the floor drain, each or one of the side walls 2 comprises a vertical part extending from the bottom part 4 to the same height as the horizontal part 3a. After this position the side wall 2 extends in an integral manner with the horizontal part 3a until reaching a wall of the room and extends then along with the wall of the room in a vertical direction. As the side walls 2 extends in this manner, it is possible to integrated the drain in the building structure in such a way that the opening of the drain 100 does not have to extend up to the walls surrounding the drain 100.

A similar vertical part may also very advantageously be provided in the back wall 1 of the drain 100 which, again, will provide the possibility of integrating the drain 100 in such a manner that a floor tiling may be provided intermediate to the opening of the drain 100 and the back wall of the room.

In another embodiment of the invention, the building structure is considered being a bathing cabin. In this case only a back wall of the bathroom is considered to constitute an extremity of the wet area of the bathroom. The other extremities are considered to be elevations originating from the wall and encircling the wet area. In an alternative embodiment, the wet area of the cabin is defined by a depression in the floor.

In fig. 3, a longitudinal cross section of an embodiment of a drain 100 according to the present invention is shown, more specifically the cross section discloses the inclination of the bottom part 4 and a trap 16 inserted into the outlet 6 of the drain 100.

In the embodiment of fig. 3, the outlet 6 of the drain 100 is bend 90° but the outlet 6 may also be straight. This bend is provided as the tubes connecting the drain 100 to

the sewer in this situation extends beneath the floor tiling. The opening of the outlet 6 is at the level of the bottom part 4 covered by a grating 5 being fixed to the bottom part 4, for instance by use of screws (not shown). Below said grating 5 the trap 16 is positioned in releasable manner.

5

This trap 16 is shown in greater details in fig. 3a. As seen from this figure, the trap 16 is assembled from mainly two pieces, an upper piece 50 and a lower piece 51. The upper piece 50 is mainly funnel shaped having a straight part 31 and the lower piece is mainly bowl shaped having a straight part 36 made water penetrable distant from its bottom 35 by penetrations 36a. The trap 16 further comprises a grating 32 for avoiding foreign bodies from going into the sewer.

10

When water is flowing through the trap 16 it follows the path indicated by arrows on fig. 3a. When no water is flowing through the trap 16, an amount of water is present in the trap 16, which amount is determined by the position of the penetrations 36a - the surface of the water will be just below the penetrations 36.

15

The straight part 31 of the upper piece 50 is when the trap 16 is assembled arranged concentric with the straight part 30 of the lower part 51 and as the straight part 31 does not extend to the bottom 5. This assembly defines a water channel through which the water flows when leaving the drain 100.

20

In order to ease the flow through trap 16 the bottom 35 is torus member shaped as shown in fig. 3a. Also, in order to ease the flow through the trap 16, the base part 52 has a rounded part 52 which, when the upper and lower parts 50, 51 are assembled, together with a similar rounded part 34 of the lower part 51 defines a rounded corner in the trap 16.

25

A sealing in form of an o-ring 33 is inserted between upper and lower parts 50, 51 in order to seal the assembly of the two parts and in order to seal the assembly of the trap 16 and the outlet 6. A groove 33 matching the shape of the o-ring is provided in the outlet 6 in order to improve the sealing and a protrusion 54 serving as an end stop for the trap 16 has been provided in the outlet 6.

30

Figs. 4a and 4b illustrates variations of the floor drain according to the invention in which only one side wall 2 is provided and in which the floor drain does not comprise a side wall.

- 5 In fig. 5 an embodiment of the structure according to the invention is shown, which structure is particularly useful in connection with vinyl sheet or the like used as floor covering. Again, the drain 100 comprises a horizontal part 3a to be situated between the vinyl sheet 18 and the floor base 24. In this embodiment the horizontal part 3a is fastened to the floor base and the vertical part 1 is fastened to the wall base by screws  
10 23. Such fastening of the drain 100 may be dispensed on the account of using glue or the like.

- The flexible vinyl sheet 18 (or any similar impermeable sheet) used as flooring covers the horizontal part 3a and is at its extremity bend and laid into the drain. More  
15 specific, the vinyl sheet abuts an inclined surface 22 of the drain and is forced against this surface by a frame 19, which is bolted to the drain 100 by bolts.

At the ends 2 of the drain 100 the vinyl sheet is also kept in place by the frame 19.

- 20 Fig. 6 shows a transverse cross section of a detail of an alternative embodiment of the building structure according to the present invention and shows more specific, a transverse cross section of the drain 100. The drain 100 comprises, again, the horizontal part 3a to be situated between the floor covers 9 and the floor base and comprises the vertical part 1 to be situated between the wall dressing and the wall  
25 base. In order to raise the grating 12 to the level of the floor covers 9 the drain 100 also comprises the heightening frame 26 so that the drain in use is similar to the embodiment of the drain shown in fig. 2. The heightening frame comprises an inner vertical part 28 resting on an edge 30 provided in the drain and extending towards the floor covers 9. Close to the floor covers 9 an edge is provided in the heightening  
30 frame 29 on which the grating 12 rests. Finally, the heightening frame comprises an outer vertical part 31 being parallel to the inner vertical part 28 and having foot portions 41 a and 41 b. The foot portion 41 is resting in a depression provided in the horizontal part 3a so as to form a straight abutment surface for the floor covers 9. The foot portion 41 b is made such as to provide the heightening frame 29 a

mechanical strength in order to avoid deformation of the drain caused by forces acting upon the grating 12.

5 All the embodiments of the drain 100 shown above are preferably made of stainless steel but other materials may just as well be used. Such other materials may be of plastic such as PVC, ABS or PP, in which case the drain can be blow molded. In case a drain 100 is made of stainless steel, the drain 100 may be manufactured by applying normal fabrication methods such as pressing, welding etc.

10 Figs. 7a-7f illustrates a method for installing the floor drain according to the invention in a bathroom or the like. As shown, the floor drain 100, which may be of the type shown in fig. 2b, is at first fixed to the brick or plaster board wall and connected to a discharge pipe. Insulating bats with upper plywood boards are then laid out (fig. 7b), and concrete base is cast (fig. 7c) so as to extend in below the  
15 bottom part 4. A concrete leveling layer with a unidirectional slope is then laid (fig. 7d) using the location of the drain as a guide for establishing the proper slope of the leveling layer, following which a watertight membrane 7 is applied on the walls and the floor, the membrane covering the flange part of the drain according to the principles shown in figs. 1a, 1b and 2a. The walls, the floor and the flange part are  
20 finally tiled, and the floor drain is covered with grating 12. As is apparent, the mounting means 200 allow the floor drain to be positioned at the required location prior to establishing the floor surface.

Obviously, the invention may also be used in pre-cast concrete building structures  
25 where the floor drain is arranged slightly above the top surface of the concrete floor slab and connected with a discharge pipe following which the leveling layer and floor covering is applied.

## CLAIMS

1. A floor drain (100) comprising
- 5 - a bottom part (4) having at least one discharge opening (5),
- a front part being integral with the bottom part (4) and having a first part (3b) being inclined to said bottom part at an angle being at least 30°, such as at least 45°, preferably at least 60° more preferably at least 75° and even more preferably about
- 10 90° or at least 90° and having a flange part (3a) being horizontal or inclined to horizontal at an angle being less than 20° such as less than 17°, preferably less than 15°, such as less than 10°, more preferably less than 5°,
- two side walls (2) integral with said bottom part and said first part, and
- 15 - a back part (1) being integral with said bottom part (4), said back part (1) extending vertically from the bottom part (4), through and above the plane defined by the flange part (3a).
- 20 2. A floor drain according to claim 1, wherein the back part further comprising an intermediate part being horizontal or inclined to horizontal at an angle less than 15°, said intermediate part being substantially at the same horizontal level as the flange part (3a) of the front part, or slightly above.
- 25 3. A floor drain according to any of the preceding claims, further comprising a grating.
4. A floor drain according to the preceding claim, wherein the front and back parts and side walls comprise bearing surfaces for said grating.
- 30 5. A floor drain according to any of the preceding claims, further comprising a heightening frame.

6. A floor drain according to any of the preceding claims having a trap comprising a funnel shaped part having a straight part and comprising a bowl shaped part which has a straight part and which is water penetrable distant from its bottom, said straight parts being arranged concentrically such that at least a part of the straight part of the funnel shaped part extends inside at least a part of the straight part of the bowl shaped part.
7. A floor drain according to the preceding claim, wherein the bottom of the bowl part is torus member shaped.
8. A floor drain according to any of the preceding claims 1-5, said bottom part (4) having an elongated discharge opening (5) with a trap (16) comprising a first section (50) which includes a funnel shaped part, a second section (51) which includes a bowl shaped part, said first section (50) extending at least partially inside said second section, and an elongated receiving bowl (6') connectable to a discharge pipe (6), said first and second sections being adapted to provide a flow of water from said second section (51) and into said receiving bowl (6') in essentially two opposed directions parallel with the extension of said elongated discharge opening.
9. A floor drain according to any of claims 6-8, wherein the trap is releasably secured to the drain.
10. A floor drain according to any of claim 6-8, wherein the trap is integral with the drain.
11. A floor drain according to any of the preceding claims, said back part including mounting means (200) for securing said drain to an essentially vertical or horizontal surface.
12. A drain according the preceding claim, said mounting means being receiving holes for screws or nails.
13. A drain according to any of the preceding claims, each of said side walls extending through and above a plane defined by the flange part (3a).



14. A drain according to any of the preceding claims 13, at least one of the side parts further comprising an intermediate part being horizontal or inclined to horizontal at an angle less than 15°, said at least one intermediate part being arranged at the same  
5 horizontal level as the flange part of the front part, or slightly above.

15. A drain according to any of claims 1-14, said front part having a vertical surface extending above the flange part.

10 16. A building structure defining a room, which structure comprising a wall and a floor having a watertight covering surface of tiling, vinyl sheet or the like, said structure comprising a drain according to any of the preceding claims 1-12, which drain is arranged in the structure so that:

15 - the flange part of the drain is situated below the watertight covering surface of the floor, and so that

- at least a part of the drain's back part which extends above the plane defined by the flange part is covered by said covering surface of said wall.

20

whereby the drain assembles the floor, said wall and the back part in an integral manner in a drain area.

17. A building structure defining a room, which structure in the drain area defines the  
25 room by a first wall and two opposed walls and a floor, each having a watertight covering surface of tiling, vinyl sheet or the like, said structure comprising a drain according to any of the preceding claims 13-15, which drain is arranged in the structure so that:

30 - the flange part of the drain is situated below the watertight covering surface of the floor,

- at least a part of the part of said side walls which extend above the plane defined by the flange part is situated behind the watertight covering surfaces of each of the opposed walls,

5 and so that

- at least a part of drain's back part which extends above the plane defined by the flange part is covered by the watertight covering surface of said first wall,

10 whereby the drain assembles the floor, said first wall and said opposed walls in an integral manner in a drain area.

15 18. A method of constructing a building structure according to claim 16 or 17, said drain being secured in a fixed position to at least one of said walls or to said floor prior to said watertight covering surface being applied on said at least one wall or said floor.

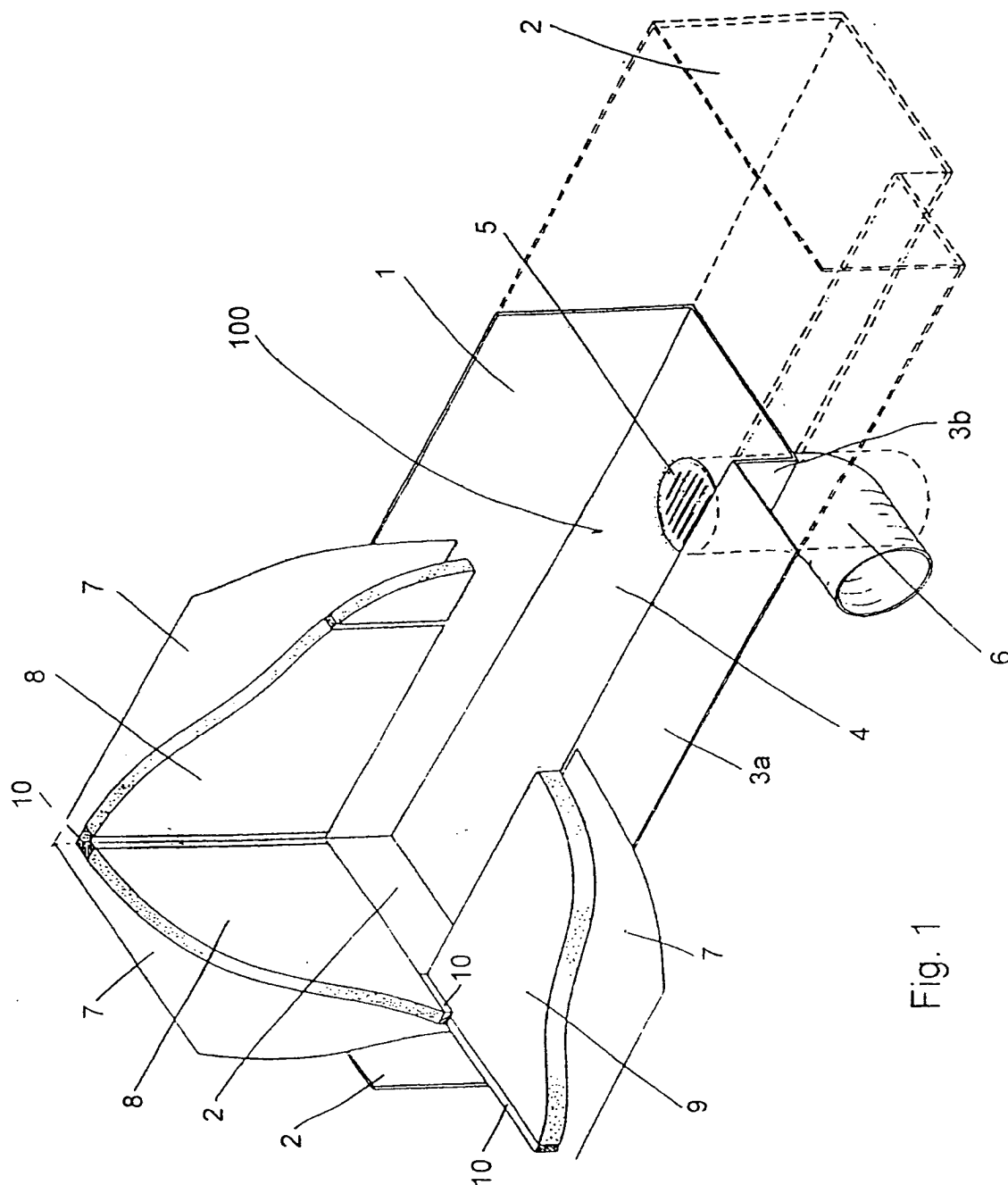


Fig. 1



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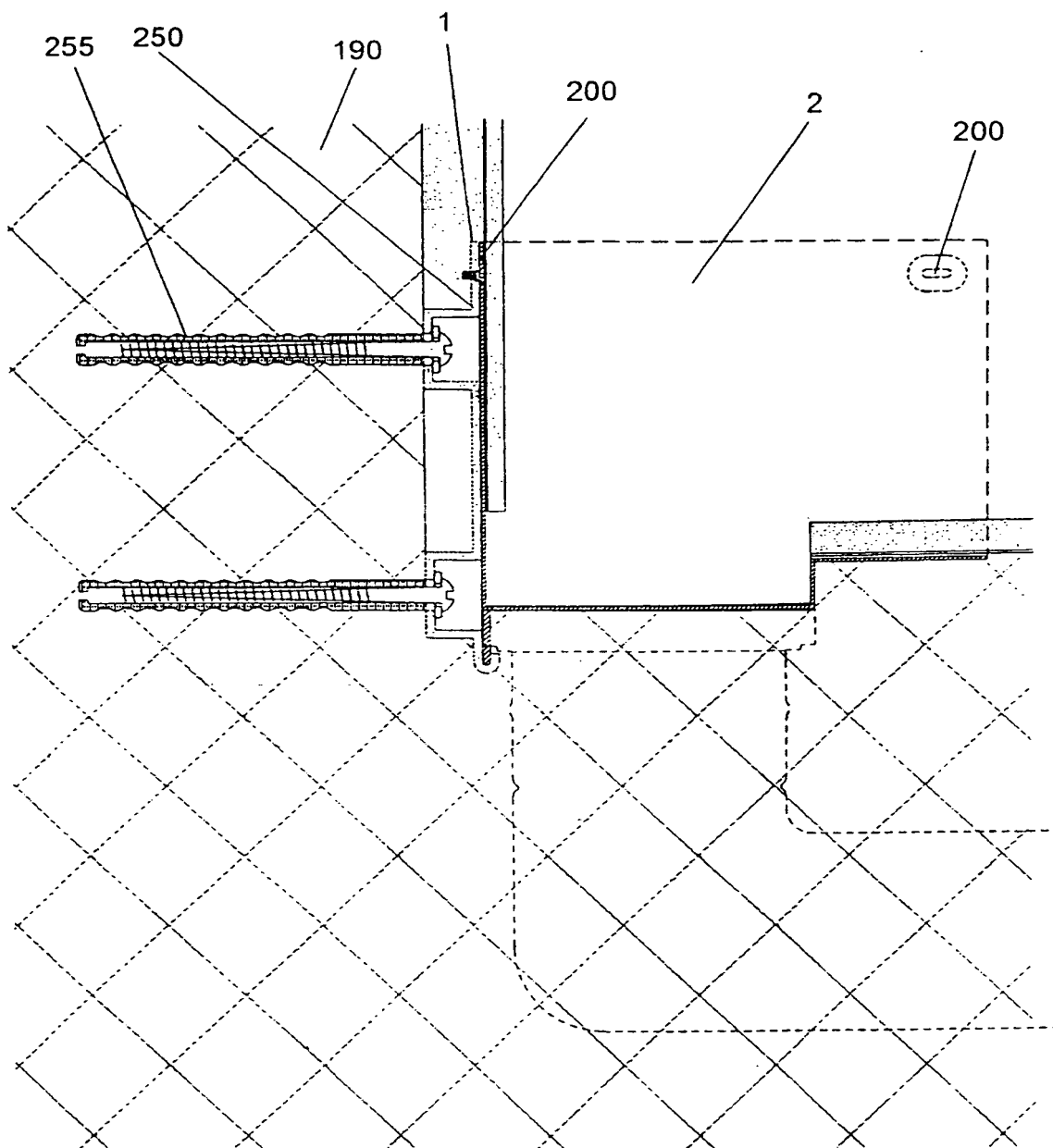


Fig. 1b

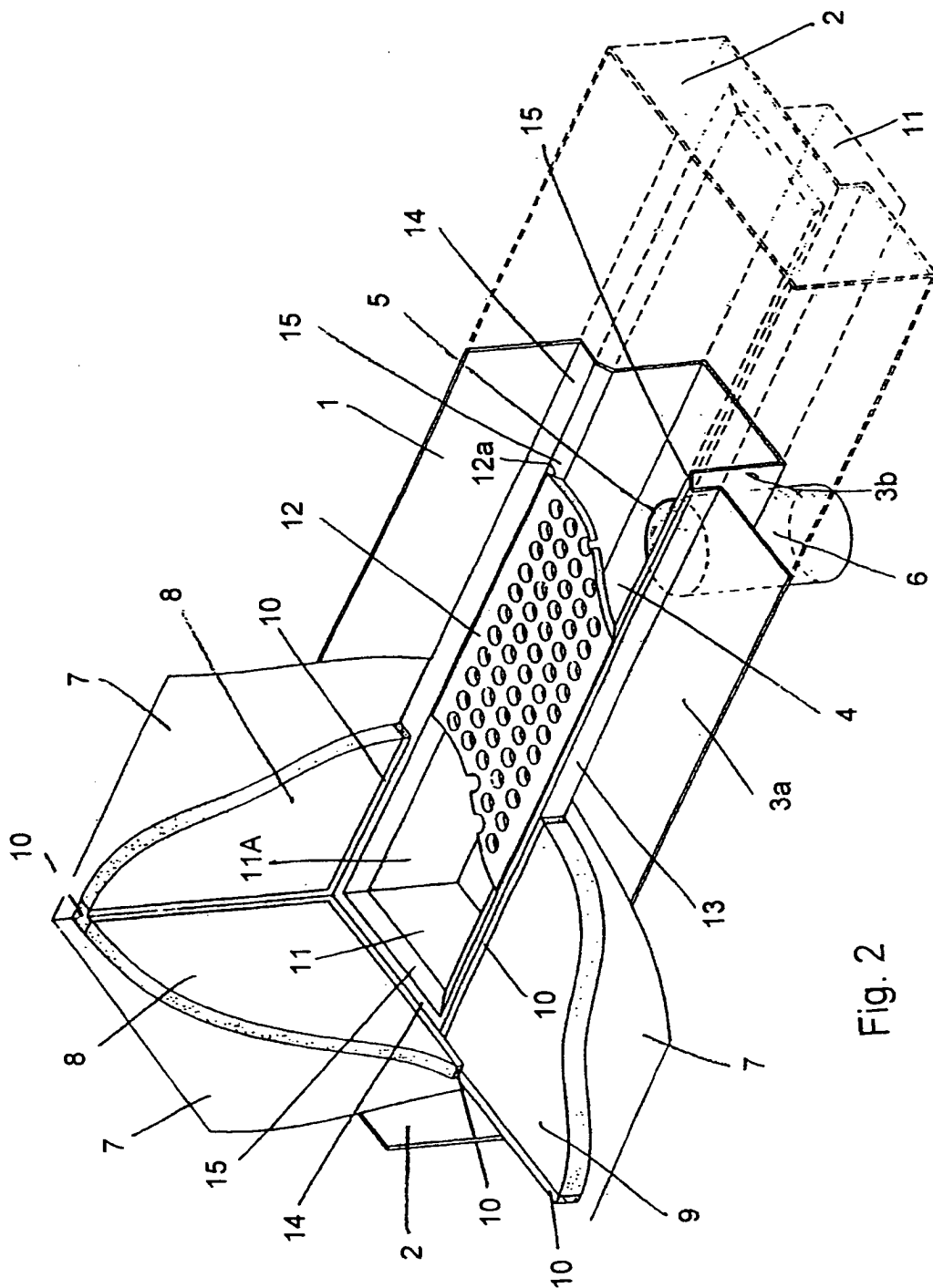


Fig. 2

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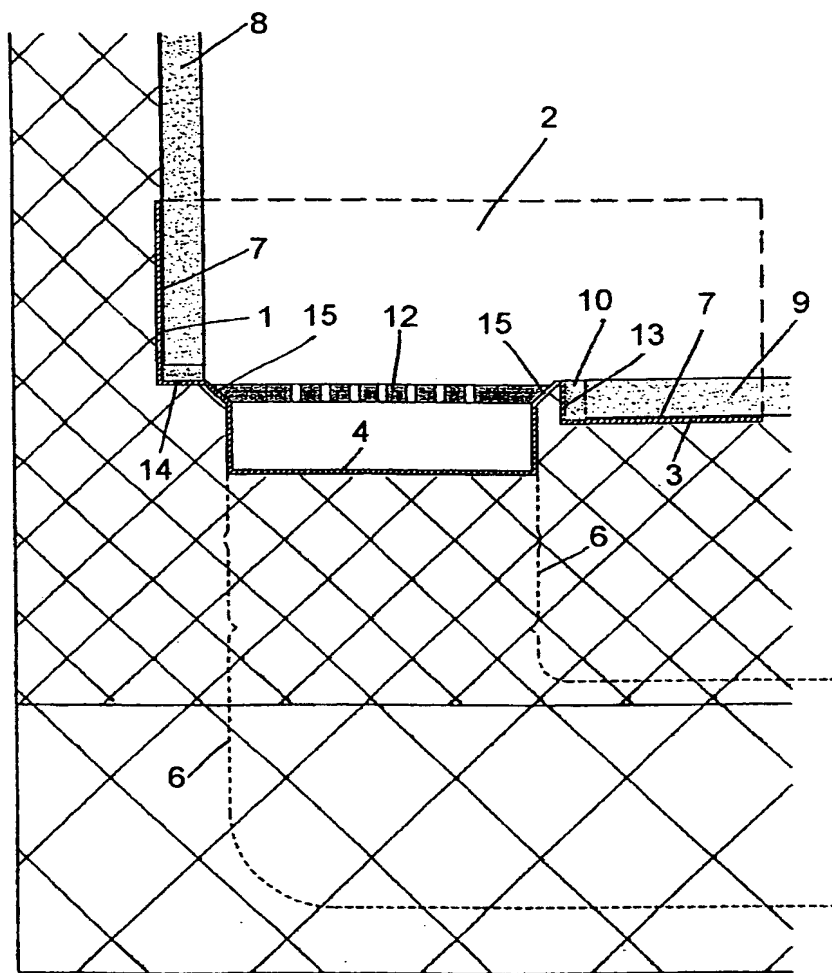


Fig. 2a

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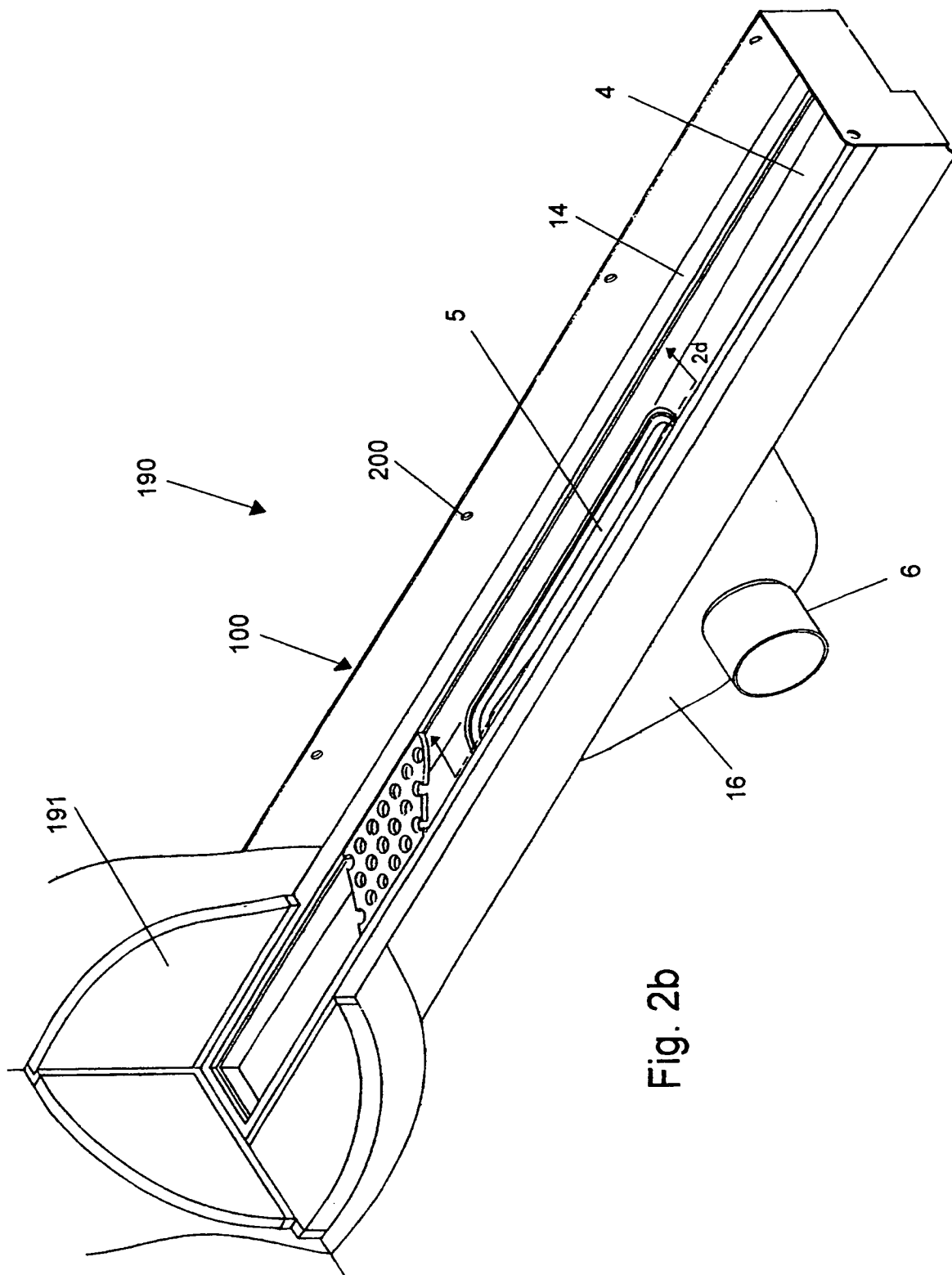


Fig. 2b



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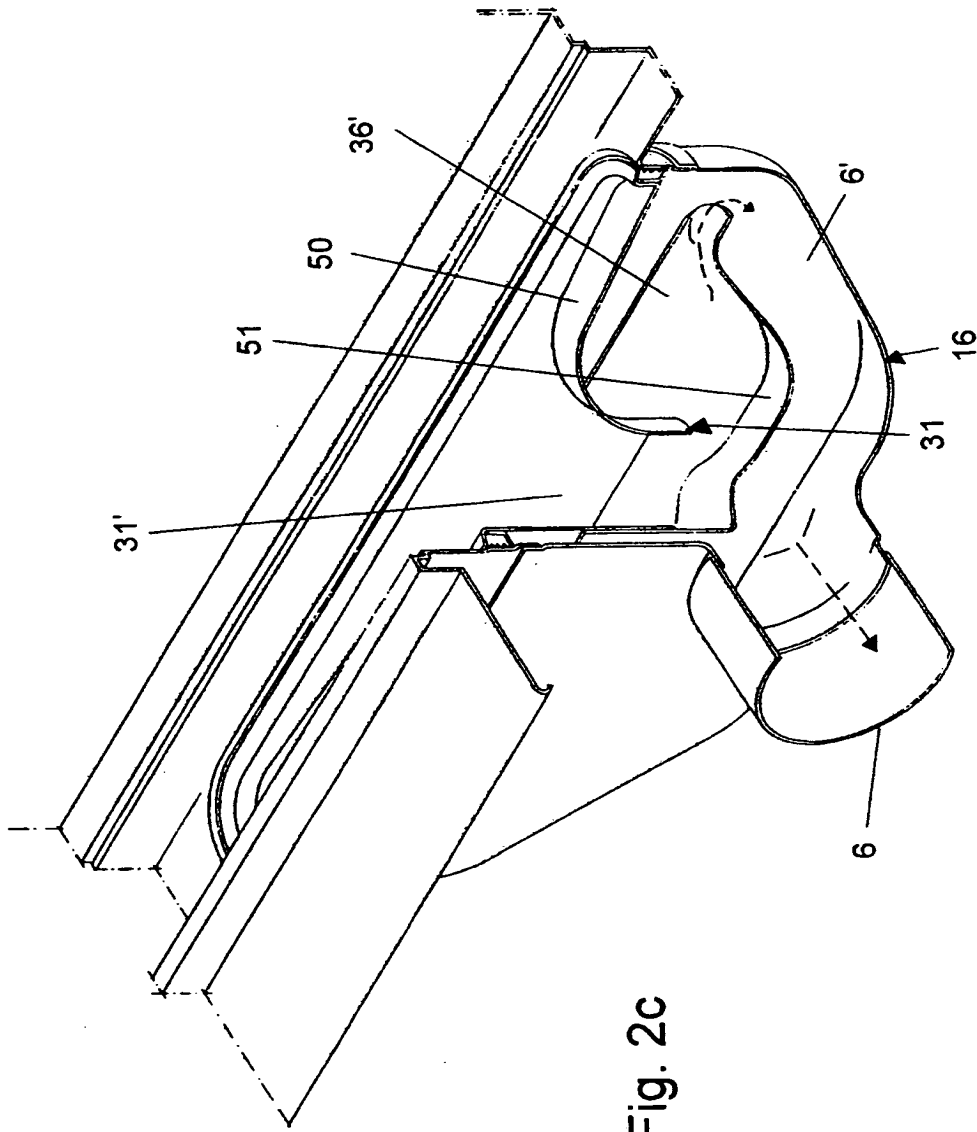


Fig. 2c

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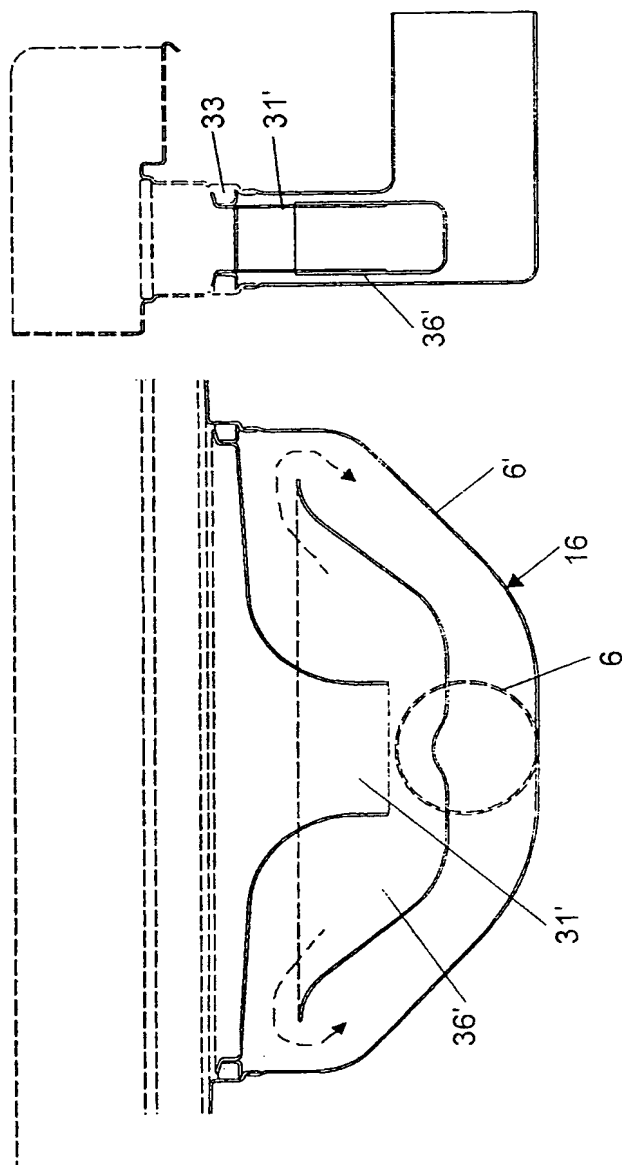


Fig. 2d

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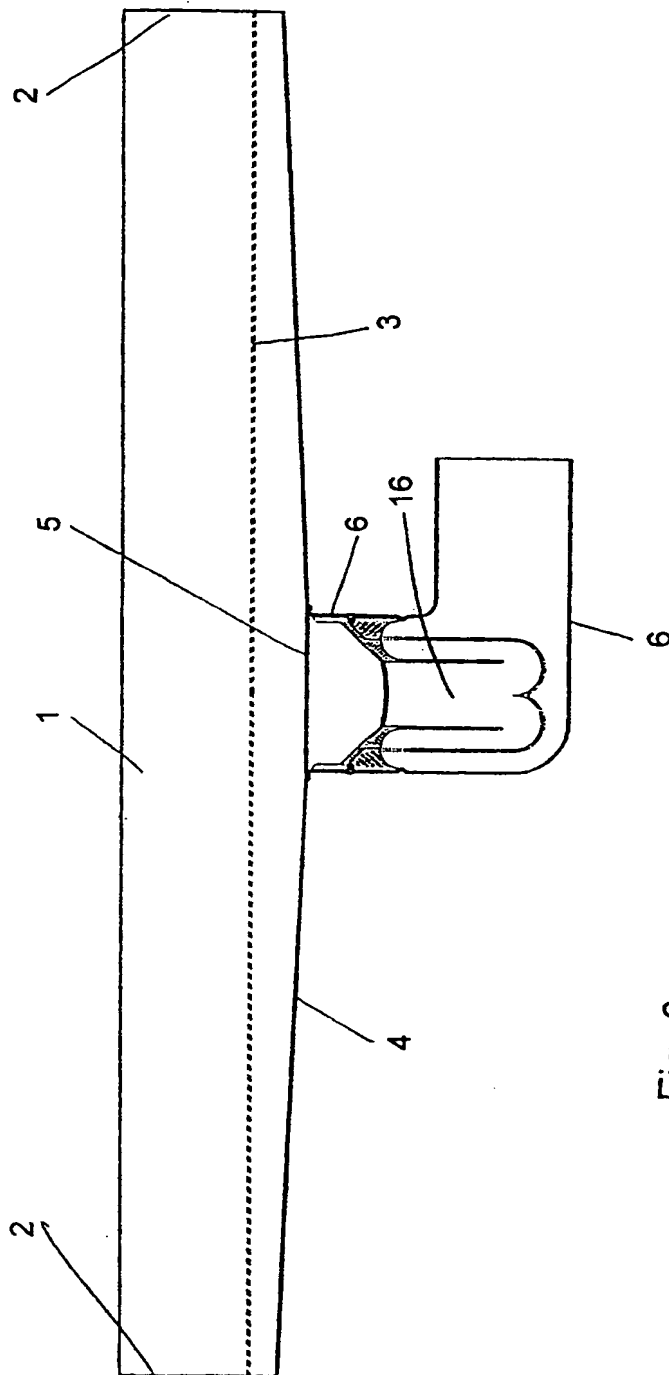


Fig. 3

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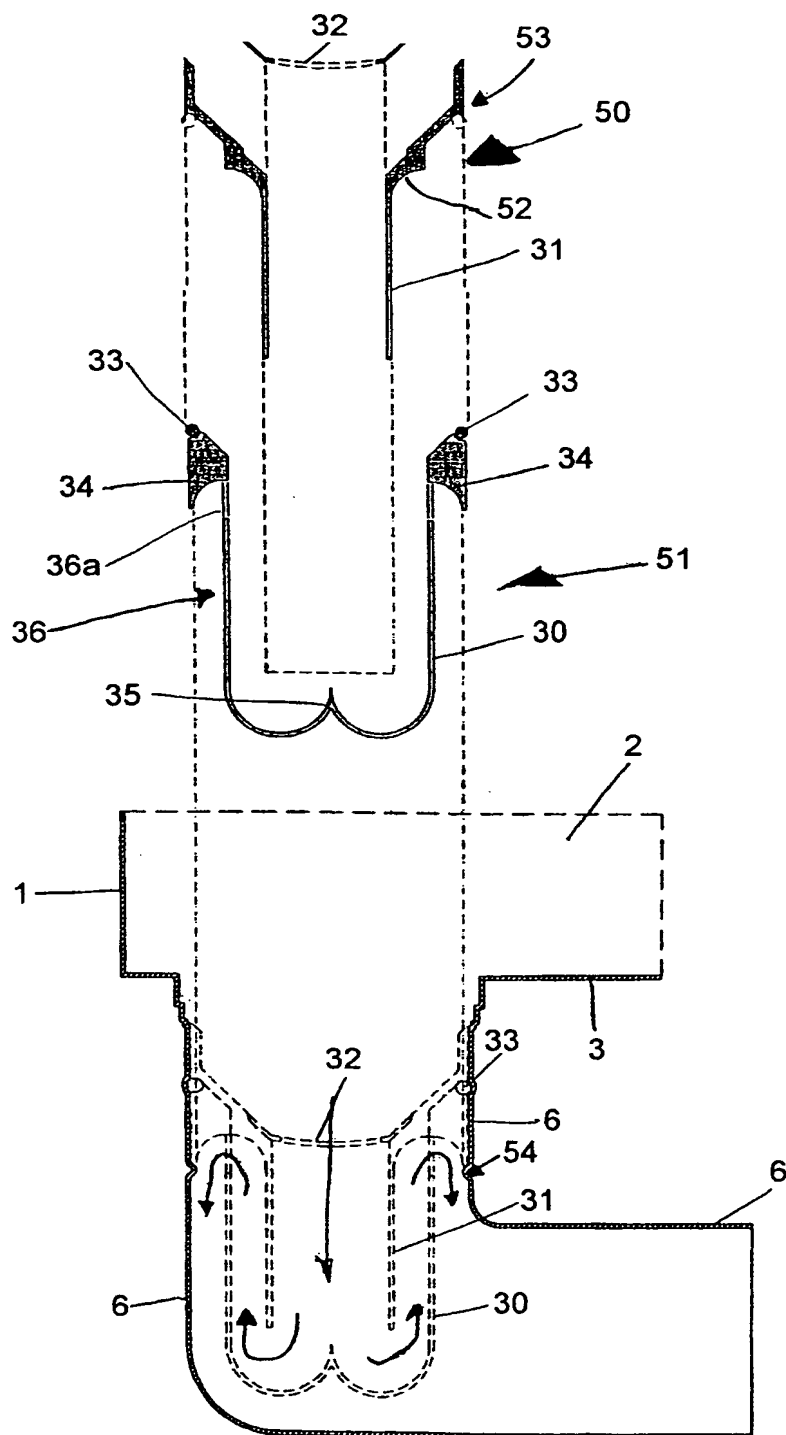


Fig. 3a

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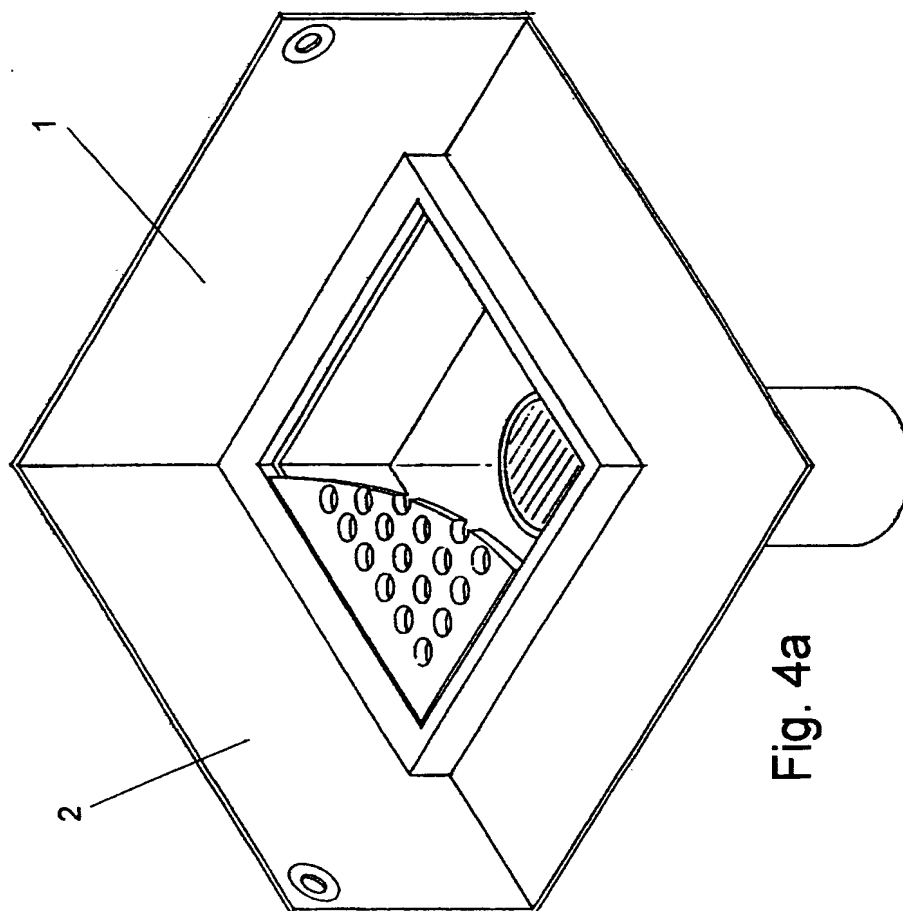


Fig. 4a

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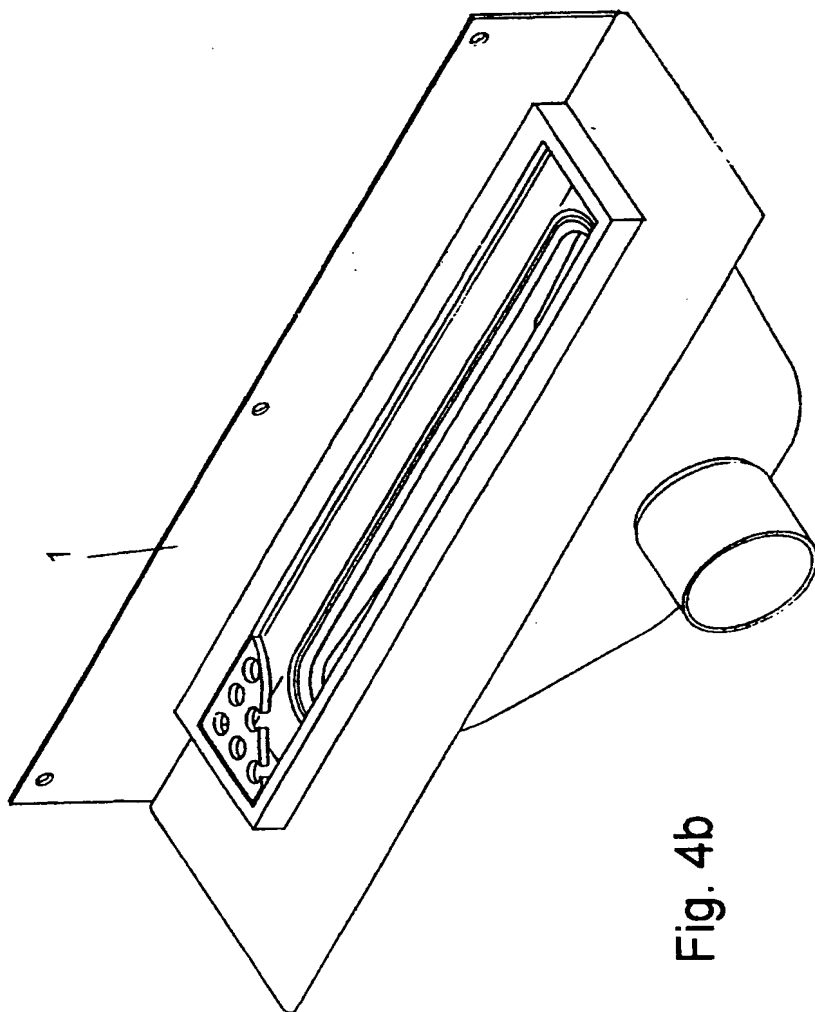


Fig. 4b

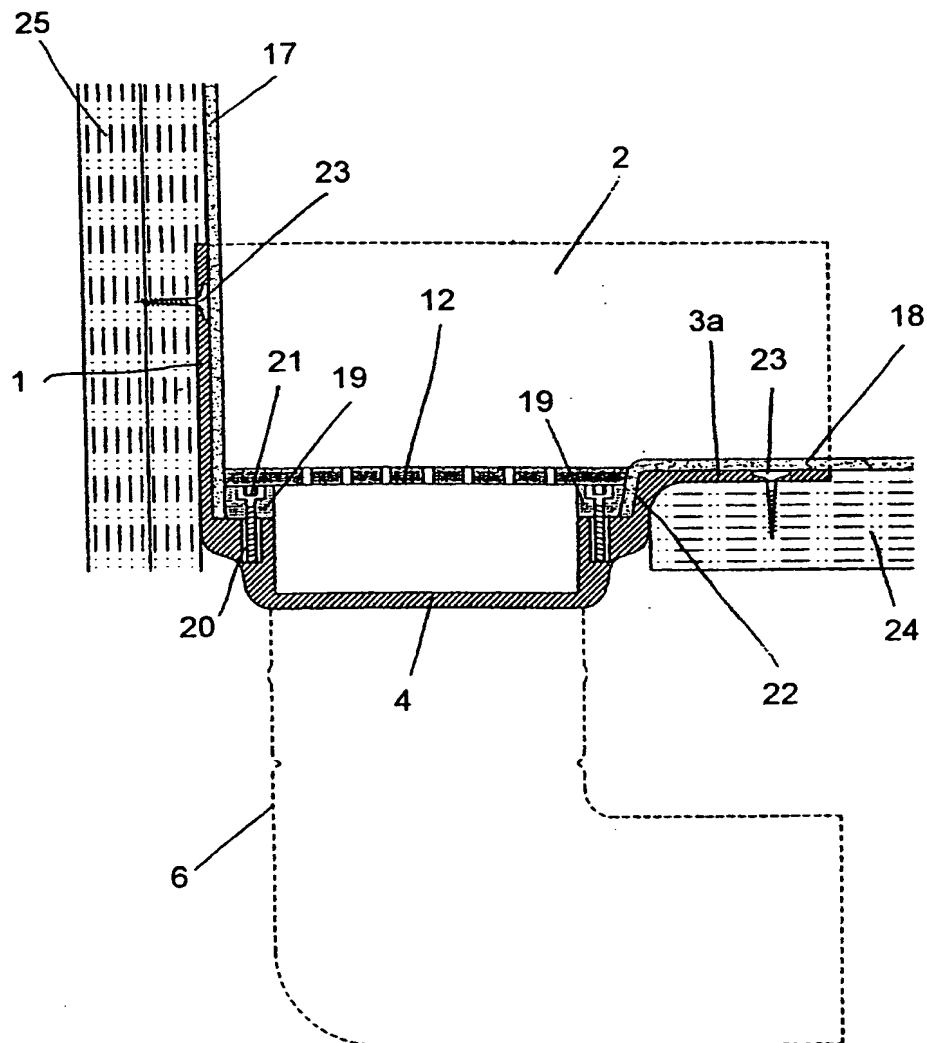


Fig. 5

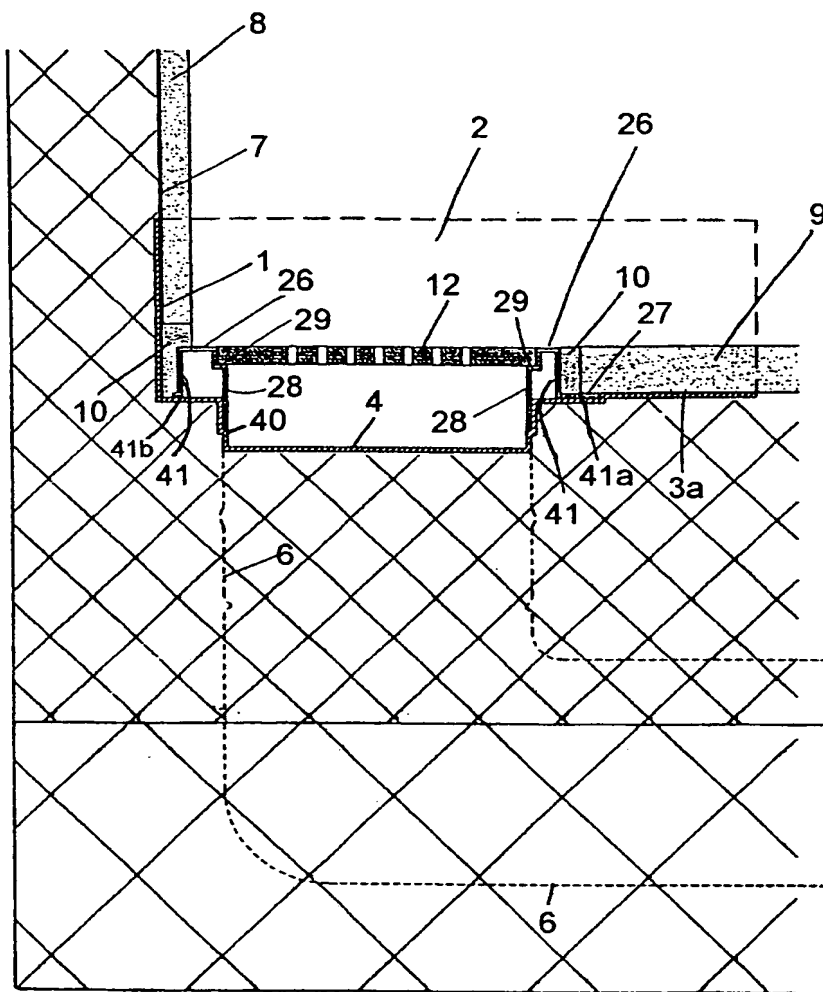


Fig. 6



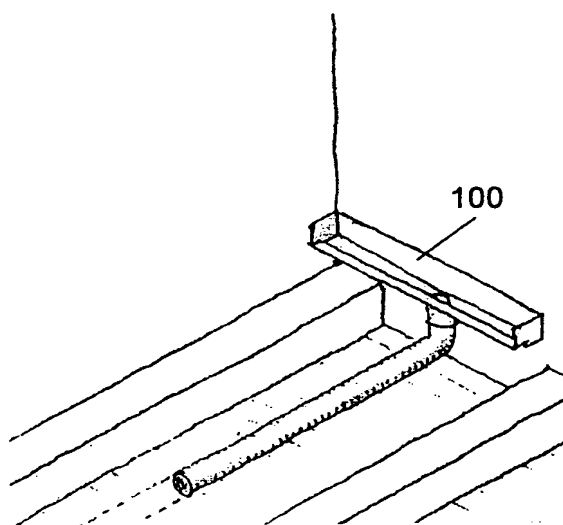


Fig. 7a

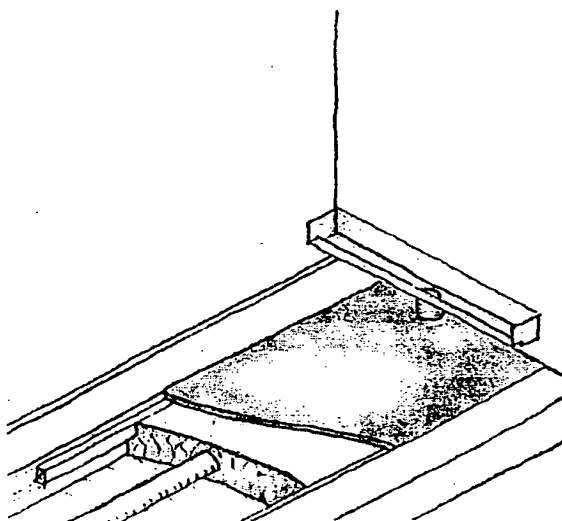


Fig. 7b

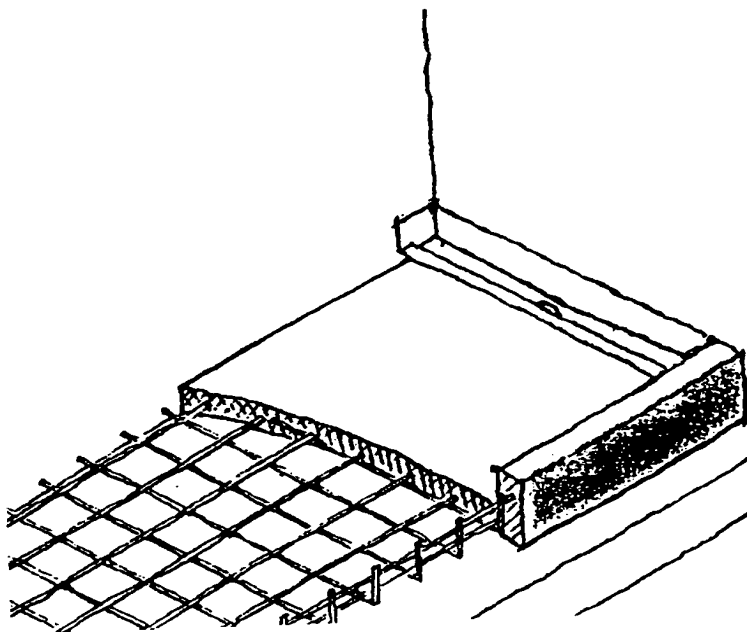


Fig. 7c

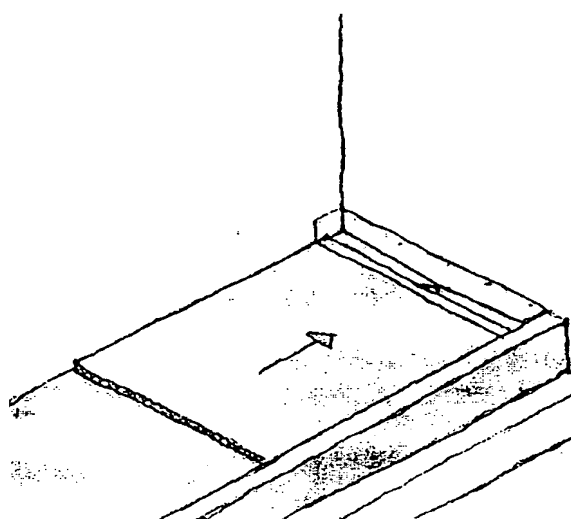


Fig. 7d

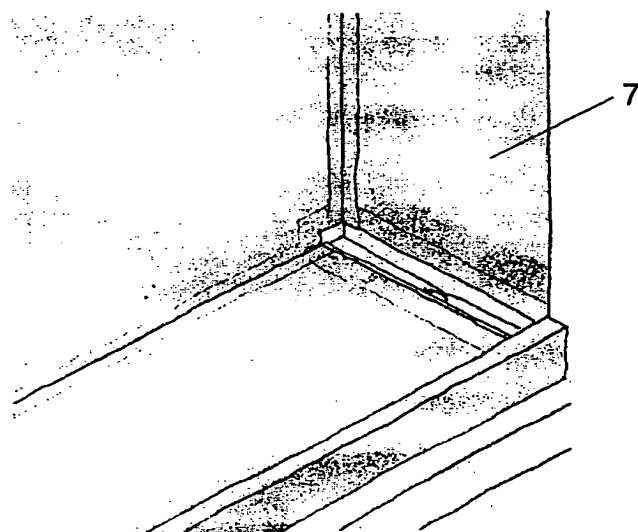


Fig. 7e

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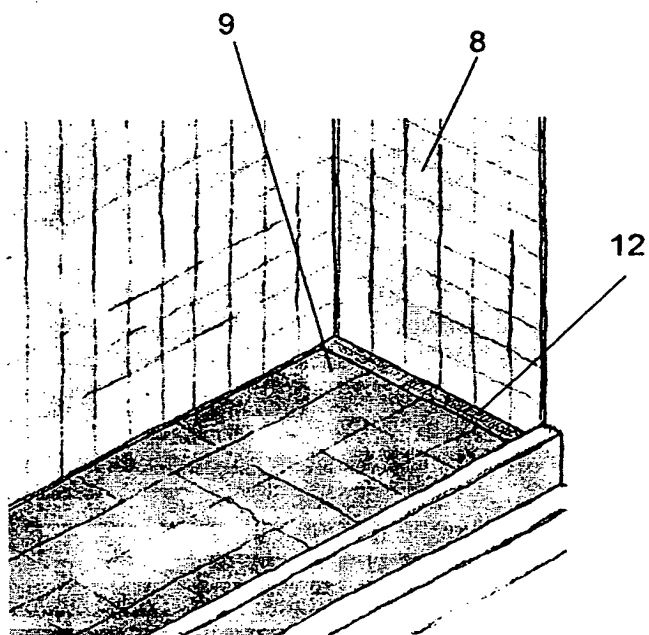


Fig. 7f

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 01/00203

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: E03F 5/04 // A47K 3/40

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: E03F, A47K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI DATA, PAJ, EPO INTERNAL

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X	DE 19723153 A1 (BAUMEISTER, S.), 10 December 1998 (10.12.98), column 2, line 44 - column 3, line 15	1-3,11-18
Y	--	4-10
X	GB 2271128 A (A.H.N. GONTAR), 6 April 1994 (06.04.94), page 5, last paragraph, page 6, first paragraph and third paragraph	1-3,11-18
Y	abstract	4-10
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☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search	Date of mailing of the international search report
7 June 2001	25 06 2001
Name and mailing address of the ISA/ European Patent Office	Authorized officer
Facsimile No.	Tommy Blomberg / MRO
Patent provided by Sughrue Mion, P.C. 2000 N. 1st St. Suite 200 Minneapolis, MN 55401-5092 USA Telephone No. 612 592 7000 www.sughrue.com	

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 01/00203

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**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

International application No.  
**PCT/DK 01/00203**

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